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THE UNITED STATES GEOLOGICAL  
SURVEY AND ITS RELATION TO  
THE UNITED STATES COAST  
AND GEODETIC SURVEY<sup>1</sup>

THE relations of near relatives may be a delicate subject for public discussion. The two organizations of which I have been asked to speak this afternoon possess the same family name as well as certain family characteristics and in consequence are often mistaken one for the other. If one Survey buys a motor truck the other gets the benefit of the advertising and the curious public remarks: "We don't see how the Geological Survey can afford it."

Yet the relations of the two Surveys have been such for more than a third of a century, and are such to-day, that I welcome this opportunity for the younger to extend congratulations to the older organization. Were I to review in detail the common history of these two Surveys there are no chapters that I should better omit nor incidents that I might need to gloss over in order that my remarks be in keeping with the spirit of this occasion. In short, the hearty congratulations that I bring are an expression of true appreciation of what the United States Coast and Geodetic Survey has been to the United States Geological Survey.

The two bureaus have much in common; the field of endeavor for each is nationwide; they are scientific in spirit and civil in organization; both are primarily field services, and the product of most of the work of each reaches the public in the form of maps. The similarity in official name also indicates a certain overlapping of function, which under some conditions might cause duplication of work. The fact that at no point in the twilight zone of superimposed jurisdiction has there been any wasted effort is good evidence that both

these branches of the federal scientific service have kept in mind the public nature of their work. It is because I realize that in the interrelations of these two bureaus the Geological Survey has been more often the beneficiary that I desire on this occasion to emphasize this gratifying fact that the two Surveys have worked in the cause of American science on a coordinated rather than a competitive basis.

In this connection I should mention the effort made thirty-seven years ago to put on an economic and efficient basis the surveying work in the Western States. Under instructions by Congress the National Academy of Sciences considered all the work relating to scientific surveys and reported to Congress a plan prepared by a special committee, whose membership included the illustrious names of Marsh, Dana, Rogers, Newberry, Trowbridge, Newcomb and Agassiz. This report, which was adopted by the academy with only one dissenting vote, grouped all surveys, geodetic, topographic, land-parceling and economic, under two distinct heads—surveys of mensuration and surveys of geology. At that time five independent organizations in three different departments were carrying on surveys of mensuration, and the academy recommended that all such work be combined under the Coast and Geodetic Survey with the new name Coast and Interior Survey. For the investigation of the natural resources of the public domain and the classification of the public lands a new organization was proposed—the United States Geological Survey. The functions of these two Surveys and of a third coordinate bureau in the Interior Department, the Land Office, were carefully defined and their interrelations fully recognized and provided for in the plan presented to Congress. Viewed in the light of thirty-seven years of experience, the Na-

<sup>1</sup> Centennial exercises of the U. S. Coast and Geodetic Survey, April 5, 1916.

tional Academy plan would be indorsed by most of us as eminently practical, and I believe the report stands as a splendid example of public service rendered by America's leading scientists. The bill which embodied the entire plan, however, failed of passage in Congress, although the part relating to the organization of the new Geological Survey was carried as a rider on the Sundry Civil Appropriation Act of March 3, 1879.

The newly organized United States Geological Survey began topographic surveys of the type that the National Academy had believed could best be executed by the Coast and Geodetic Survey, and the younger Survey has continued this kind of mensuration surveying until it has covered more than 40 per cent. of the country and become the principal map-making bureau of the government. In course of time also more or less legislative authority has been given for the control work, vertical and horizontal, needed for these topographic surveys, so that there has been evolved exactly the opportunity for duplication of work that the National Academy sought to prevent. The invitation to speak this afternoon on the subject of the relation of the United States Geological Survey to the United States Coast and Geodetic Survey is a privilege that I value highly because it gives me the opportunity to point out that the result that Congress failed to insure by legislation has been attained by voluntary scientific cooperation.

In topographic mapping the activities of the older bureau stop at the coast, as its name suggests; its mensuration surveys elsewhere are purely geodetic and represent a refinement of method and an accuracy of result that is not necessary in the ordinary mapping of the country as a whole, although these engineering results are absolutely essential. Members of the Geological

Survey most familiar with these large contributions by the Coast and Geodetic Survey have estimated that the value of the geodetic work done by the older organization that would otherwise have necessarily been done by the Geological Survey has aggregated not less than a million dollars, and if the future engineering work of the Coast and Geodetic Survey as now planned is carried to completion another million dollars should be included in our total indebtedness to the older Survey.

The United States Geological Survey is proud of its pioneer work in aid of the development of the resources of Alaska, yet we are not forgetful of the fact that the real pioneer in Alaska was the United States Coast and Geodetic Survey, which started its work in Alaska thirty years earlier than our own Survey.

It has been the custom of each of these Surveys to supply the other with photographic copies of field sheets of current work, and I am glad to record the fact that cooperation of this type has not been one-sided. Our topographic survey of the Bering River coal fields, for instance, yielded data that were incorporated in the important Coast Survey chart of Controller Bay, which was published before the Geological Survey issued its topographic map of the larger area. In this way the public was served by receiving the information earlier than if the Geological Survey had insisted upon first publishing its own results. The testimony of the members of the Alaskan division of the Geological Survey is that the cooperation in Alaska has been as hearty and close as if the Coast and Geodetic Survey men and the Geological Survey men belonged to the same bureau.

In this connection too should be mentioned the earlier geologic observations made in Alaska by members of the Coast and Geodetic Survey, and chief among

these scientist pioneers in Alaska is our own Dr. Dall, the credit for whose half century of scientific work under government auspices is shared by the Coast and Geodetic Survey and the Geological Survey. In connection with its engineering work also, the Coast and Geodetic Survey has made important scientific contributions that are distinctly geologic in character, and as geologists we are almost inclined to lay claim to Hayford's work on isostasy and Bowie's gravity determinations.

Every geologist who works in that attractive borderland where both the products of geologic processes and the processes themselves can be studied side by side—our Continental shore line—has made large use of the Coast and Geodetic Survey charts, and as competent witnesses we gladly testify to the accuracy of these charts and we compliment their makers. Such geologic investigations as the study of changing shore lines, the history of the submerged margins of the continent, and the origin of sediments are being given attention by the Geological Survey, and all these studies must be based upon the surveys and resurveys made by the Coast and Geodetic Survey.

This brief review of the relations existing between these two bureaus may serve a larger purpose than the sincere expression of congratulations to the Coast and Geodetic Survey on this centennial occasion. For nearly four decades these two Surveys have been working side by side from Florida to Alaska without the specific statutory separation of functions deemed advisable by the National Academy and therefore with full opportunity to overlap their fields of operation, to duplicate work, and thus to waste public money. The fact that there has resulted economical coordination rather than wasteful competition stands to the credit of those in administrative control of the two bureaus, especially the

superintendents and directors of the earlier years of this period of successful cooperation. Naturally too the spirit of hearty cooperation is equally shown between the scientific assistants of the two services.

In these days, when as American citizens we have so deep concern in the question of public regulation of private business—a nation-wide concern arising from a broadening appreciation of society's interest in the individual—it may be opportune for some of us as public officials to pause and consider the question of regulation of public business. Do we apply the same rules to our conduct of the business of these federal bureaus that we advocate for the control of corporations? Some of us as scientists may feel that the comparison of a scientific bureau with an industrial corporation is forced if not absurd. Yet I trust that the two are alike in being not only productive but productive without undue waste. The National Academy report of 1878 to which I have referred contains a significant phrase: in presenting to Congress the ideal for a scientific bureau as they saw it these scientists described the ideal plan as one that would yield the "best results at the least possible cost." Those few words express a practical administrative policy equally good for big business and pure science. And it is as illogical for a scientific bureau as for a munitions plant to shy at a cost-keeping system.

Here at the federal capital we have some two score scientific bureaus distributed through several executive departments. There exists no general plan of division of duties among these different agencies for public service, but as a fundamental policy we have pinned our faith to a sort of declaration of independence that all scientific bureaus were created free and equal. My acquaintance with bureau chiefs and their intimate advisers perhaps warrants

me in describing them as possessing at least average ambitions, with the inevitable result that we have seen some field of scientific investigation occupied by two or more bureaus, other and less attractive fields shunned, and even other fields claimed by those bureaus not best qualified to make the largest use of the opportunity for creative work. Among ourselves, we know of so many illustrations that no examples need be cited; each of us no doubt feels sure that he can at least specify the sins of other bureaus. This is the competitive system almost at its worst, because it is countenanced by men of scientific training and high ideals of public service. Fortunately, however, the two bureaus of which I have particularly spoken, as well as some others, furnish proof that there can be coordinated effort in federal scientific work.

I have here referred to the business world, because I believe we must apply some of the same rules to our scientific work. However slight may be the statutory limitations imposed by Congress upon these scientific bureaus, we can not escape the requirements of economic law, which is never a dead letter, although too often unread. If in the world of private business the competitive system sometimes breaks down and fails to protect the public, so in our narrower circle of public business there may be a similar failure of competition to produce the best results. The question is always fair and is sometimes pertinent, How far should these government scientific bureaus go in seeking to enlarge their field of usefulness? Does this competitive spirit by its appeal to individual ambitions make for better public service? To what extent is it good public policy to have the public servants on the *qui vive* for new opportunities to serve, new worlds to discover, new appropriations to get? Service and discovery are the proper ideals of the individual

investigator, but should even ideals justify trespass and disregard of others?

First of all, we must agree that however great its advantage as a method of stimulating progress, competition must be always fair. If we are to apply the principles of the Sherman Act and the Clayton Law to public business, unfair methods must be ruled out as illegal. I do not believe my comparison is a forced one. You can read decrees of the federal courts that prohibit corporations from doing things that are somewhat similar to practises of which we ourselves have been guilty. In one case, among other items, the defendant corporation was enjoined from making false representations concerning competitors and from hiring away employees of competitors—simply a twentieth-century echo of the ninth and tenth commandments of the Mosaic law, especially the edict against coveting thy neighbor's man-servant. In the public service proper coordination of work often makes transfers from one bureau to another desirable, and so as a means of increasing efficiency such transfers are and should be welcomed, but efficiency from the larger view is attained only when the interests of both bureaus are considered, in which event the individual also profits by his larger opportunity. With science alive and expanding in so many directions, subdivision and redistribution of functions makes certain interbureau transfers of specialists absolutely necessary.

Another unfair practise, not countenanced by the courts in their regulation of private business, is tricky advertising as a method of meeting real competition. Honest advertising must be founded on truth, and even scientific bureaus may need sometimes to apply this acid test to the statements they give out to the public. Scientific investigations whose purpose is to increase human knowledge do not find their

best expression in publicity whose principal object is to impress the Appropriation Committee. Such advertising may have its foundation in truth and yet may possess a superstructure so large and top-heavy as to violate all engineering formulas.

Unrestrained competition in the public service, then, presents some dangers no less real than those incident to unregulated competition in private business. The question must come home to every bureau chief and to his intimate advisers: To what extent is a competitive struggle for new territory warranted, even when only fair methods are used in this endeavor for bureaucratic expansion? I am aware that we may invoke "the public demand" and put forward other equally plausible reasons, but even if we sometimes fool Congress and on rare occasions fool each other, we never fool ourselves. Of course the individual investigator, self-centered with enthusiasm in his discovery of a new line of research, may be wholly ignorant of the fact that among the two thousand or so fellow scientists here in Washington, some one in another department has already preempted that subject and possibly carried the work well on to completion; but however unconscious the scientific worker in one bureau may be of the obvious relation of that problem to the work of some other bureau, only rarely indeed can his own bureau chief plead any such ignorance or innocence. May I express my individual conviction that the bureau chief who makes strategic moves in this contest for enlargement of field of work is just as conscious whether he is playing the game fairly as the "captain of industry" that we have thought ought to be investigated by the Department of Justice.

Even at its best, however, this competitive system is wasteful. The public has too often found that competition as the

safety-valve of business costs too much in steam. If in the branch of public business in which we are engaged the ideal is to render the best service at the lowest cost, must there not be regulation, and regulation which recognizes that there are what we may term natural monopolies in the government scientific service? The monopolistic idea must here yield the same real savings to society that have come with the recent growth of public-utility monopolies. The product of our scientific bureaus is not a staple commodity, but a special service to the public, and under governmental auspices this service is offered without price, yet that does not mean that we are any less vitally interested in costs. If monopoly will enable these scientific bureaus to render the best service at the lowest cost, the competitive system in scientific work should go to the scrap heap as out of date.

The adoption of the monopoly system, however, involves here, as in the field of public utilities, the correlative idea of adequate regulation in the public interest. And here is where we may be in danger of losing our way, for the question of course obtrudes itself: Who is the guide; who is to define the field of work to be monopolized by this or that bureau? My own belief is that Congress can not be expected to enforce even its own wishes in the matter. Some years ago the chairman of a Congressional committee that had made a most thorough investigation of one of the departments, himself a trial lawyer of large experience, admitted to me that the investigation had been largely in vain; in his own words, "I know the department is full of duplication, but it would take a trained scientist to put his finger on it all." Nor can the cabinet officer be expected in a few years to discover all the overlaps in his own department, much less to learn the logical and proper coordination of the scientific

work in several departments. Thus the responsibility in large measure falls back upon the bureaus themselves—they must provide that careful coordination which precludes wasteful competition and promotes helpful cooperation. To return for a moment to my text, I do not know that the successful coordination of the work of our two Surveys has been due in any large degree to the influence of Congress, although my experience is that appropriation committees do watch these details, nor have I ever known any Secretary of the Interior or of the Treasury or of Commerce to define this wise policy; the happy result must be credited rather to a small group of administrative chiefs in each of these two scientific bureaus.

The obligation for the proper conduct of the scientific work of the government, therefore, can not be lifted from the shoulders of the bureau chiefs and their immediate associates in the work of administration. Moreover, this responsibility is a double one—we should feel not only the duty as public servants to avoid wasteful use of the public money, but also the obligation as scientists to conserve scientific effort by preventing duplication in research and in publication. Aside from the absurdity that lies in the spectacle of bureau chiefs trying to impress congressional committees, do we not by our acts suggest a lack of faith in science itself? We talk impressively of the day of highly specialized science and then go out and poach on what is properly the domain of others. Since the days of Aristotle students of politics have recognized as a weakness in democracies the habit of not appreciating the value of trained specialists. Within a few weeks the *London Financial News* remarked editorially upon the national neglect of science to which is now attributed the bulk of the British failures under the test of war. But as self-labeled

scientists are we not ourselves similarly lacking in our appreciation of the value of science and of scientific organization in so far as we fail to recognize that by reason of its experience and its personnel some other bureau, even in another department, can better handle a certain subject than our own bureau. Especially when a new idea is before the public are we apt to be temporarily blinded by its popularity and thus lose sight of the eternal fitness of things. I can best illustrate this by mention of a current topic. The fixation of nitrogen is a matter of national importance; plainly the military departments are most concerned by reason of their need of nitric acid for munitions, yet as against any claims of the War and Navy Departments must be set the fact that nitrogen is one of the essential elements in fertilizers, and its production is therefore of vital concern to the Department of Agriculture; however, the mineral deposits necessary to the fixation process are to a large extent under the jurisdiction of the Department of the Interior, not to mention some of the most available power sites; nor must I overlook the fact that this subject was first investigated and reported upon by a bureau in the Department of Commerce. So the competitive contest is on, but the obviously most reasonable consideration is still in the background. What department or bureau, if any, has already on its rolls the force of hydraulic and construction engineers ready to begin the preliminary studies and surveys and the organization already adapted to push the construction of the plant, should Congress authorize this innovation in governmental activity? As evidence of my good faith in mentioning this illustration, let me add that an investigative bureau like the Geological Survey is not organized on a plan at all adapted to the construction and operation of an industrial plant; and all that I may

claim for our bureau in this connection is that we sometimes recognize the obvious.

Those of us who have been responsible for the work of securing the needed appropriations are at times likely to have our judgment warped by what we think are the exigencies of the case. A member of a scientific bureau was once so concerned for the success of his bureau that he even recommended its transfer to another department so as to get under the wing of a more generous appropriation committee. The logic of the situation does not always appeal to us, and we are willing for the moment to sell our birthright for a larger appropriation. The obvious fact in this matter of the interrelations of the scientific bureaus of the government is that if the bureau chiefs do not always exhibit an appreciation of the proprieties in scientific investigation nor seem to possess much idea of perspective in the alignment of boundaries, can even the most experienced legislators be expected to make the best distribution of scientific work?

The possession by any bureau of even a skeleton organization of efficient specialists in a certain field would seem to be the practically unanswerable argument for entrusting to that bureau any new and enlarged work in that field whenever Congress deems larger appropriations advisable. That is the type of practical logic that is recognized in private business, for under public regulation of natural monopoly the public-utility company that first enters the local field is recognized and even protected by the public-service commission, as long as the service rendered is at all adequate. In the business world the day of preferment of special applicants in the granting of municipal franchises has passed, and in our government business there is no better reason for granting special privileges to overzealous bureau chiefs. I sometimes think

that the bureau chief comes nearer being safe and sane in his public acts and utterances in the intervals between sessions of Congress.

In this informal comparison of the actual and the ideal in the administration of the scientific bureaus of the government, I have had ever in mind the existence of a real basis for optimism in the splendid record of the Coast and Geodetic Survey and the Geological Survey in absolutely coordinating their endeavors in the public service. And I desire simply to add that this practical cooperation has been so easily accomplished that it is only as we review these several decades of joint work and estimate the value of the reciprocal services rendered that we realize how ideal have been the relations between the two Surveys.

GEORGE OTIS SMITH

U. S. GEOLOGICAL SURVEY

ABSTRACTS OF ADDRESSES AT THE  
CENTENNIAL EXERCISES OF THE  
U. S. COAST AND GEODETIC  
SURVEY

APRIL 5, 1916

*The Bureau of Fisheries and Its Relation to the United States Coast and Geodetic Survey:* DR. HUGH M. SMITH.

Long before the Coast and Geodetic Survey and the Bureau of Fisheries were adopted by the same mother department and thus became sisters; in fact as early as 1873, when the former had already attained a robust maturity and the latter was still in swaddling clothes, there began close cooperative relations. These have continued up to the present time and have increased in intimacy and value in more recent years since the two establishments became members of the same official family. It is only fair to acknowledge that at first the cooperation was very one-sided, consisting largely of the bestowal by the Coast and Geodetic Survey of substantial favors in return for profuse thanks. From 1880, when the Bureau of Fisheries began to acquire vessels of its own, that service began to repay, in part at least, some of its obligations, and ultimately it contributed substantially to the published records of the Survey. The former has always depended on the latter for its